



# Luminch One

Written By: Francisco Castro

## TOOLS:

- [Cutting mat \(1\)](#)
- [Hobby knife \(1\)](#)
- [Hot-glue gun \(1\)](#)
- [Masking tape \(1\)](#)
- [Pencil \(1\)](#)
- [Rule \(1\)](#)
- [Soldering iron \(1\)](#)
- [Swiss Army knife \(1\)](#)
- [White glue \(1\)](#)

## PARTS:

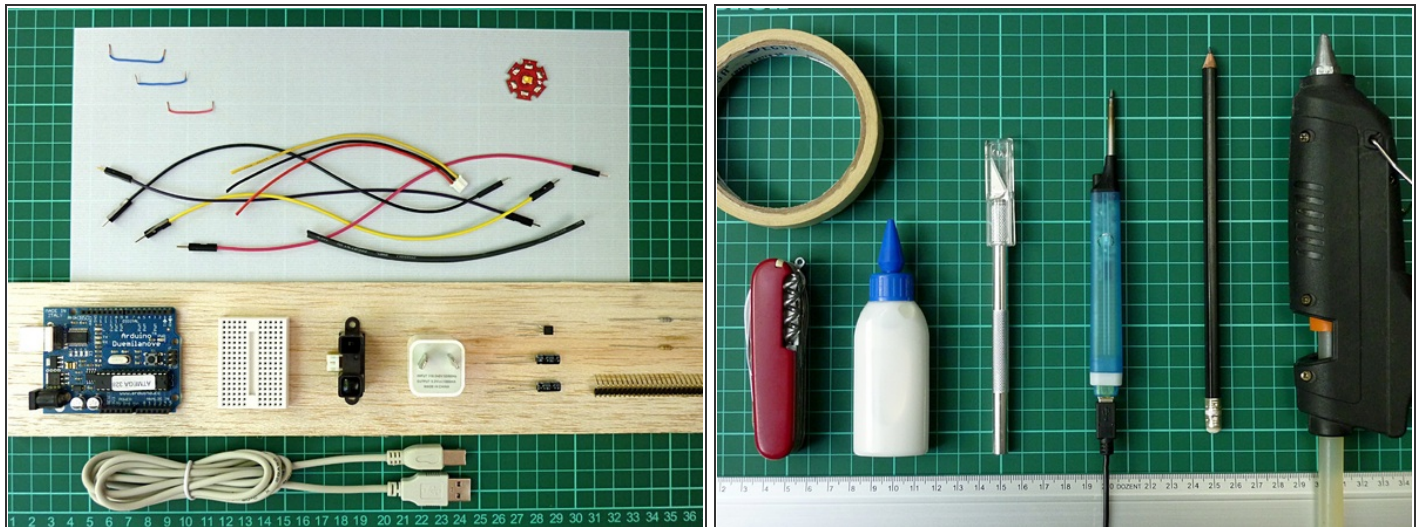
- [Infrared Proximity Sensor Long Range - Sharp GP2Y0A02YK0F \(1\)](#)
- [Infrared Sensor Jumper Wire - 3-Pin JST \(1\)](#)
- [Arduino Uno \(1\)](#)
- [Breadboard Mini Self-Adhesive \(1\)](#)
- [Electrolytic Decoupling Capacitor - 100uF/25V \(2\)](#)
- [Jumper Wires Premium 6" M/M Pack of 10 \(1\)](#)
- [Luxeon Rebel High Power LED Breakout - Warm White \(1\)](#)
- [Break Away Male Headers - Right Angle \(1\)](#)
- [USB Cable A to B - 6 Foot \(1\)](#)
- [Wall Charger - 5V USB \(1\)](#)
- [Resistor 18 ohms 1W \(1\)](#)
- [Resistor 220 ohms 1/4W \(1\)](#)
- [NPN Transistor BC337 \(1\)](#)

- [Short jumper wires \(like the conductors from solid core UTP cable\) \(1\)](#)
- [Heat shrink 3mm diameter \(1/8 inch\) \(1\)](#)
- [Balsa Wood Sheet 36" x 3/16" x 3" \(1\)](#)
- [Tracing Paper Sheet A4 110 to 200 gsm \(1\)](#)

## SUMMARY

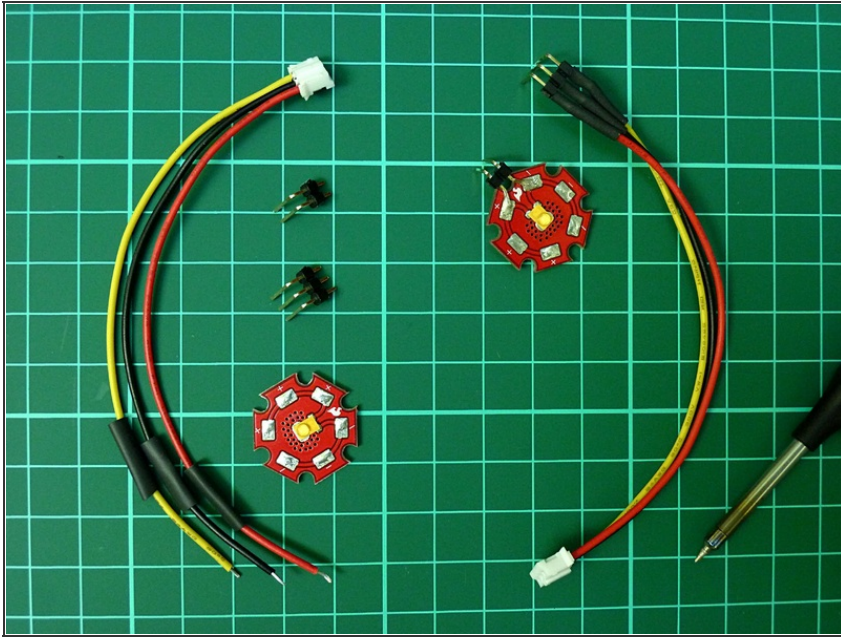
Luminch One is an interactive lamp controlled by the movements of your hand. Wave your hand over it to turn it on or off, or move your hand up or down above it to change its brightness. Inside the lamp, an Arduino hooked to an infrared distance sensor tracks your hand and sets the state and the brightness of the LED lamp.

### Step 1 — Get the tools and materials



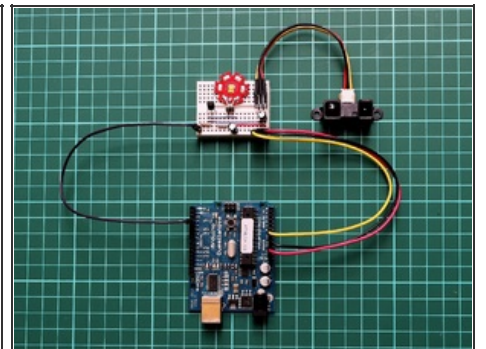
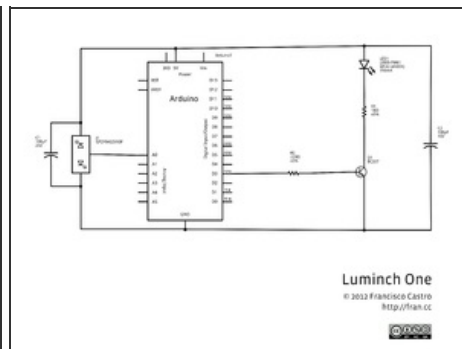
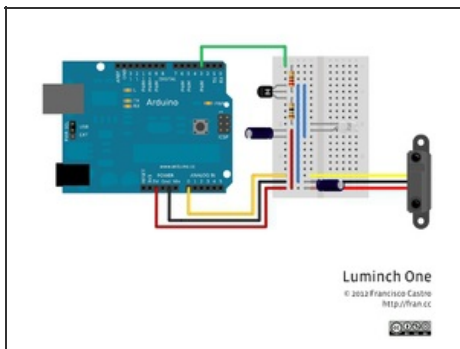
- You can get most of the electronic parts required for this project from [Sparkfun](#). Click the items from the parts list to go to the product page of each part.

## Step 2 — Solder the connectors



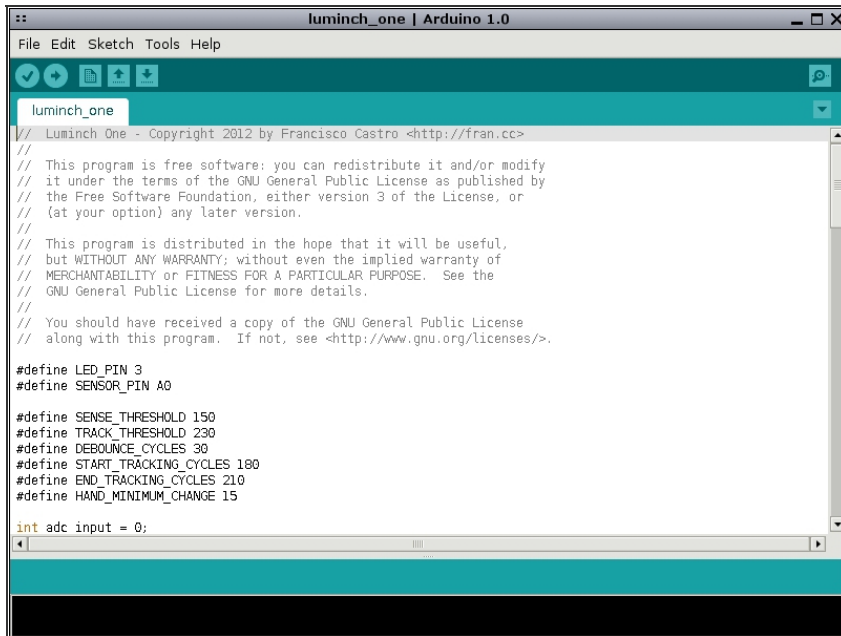
- Cut a 2-pin piece from the right-angle header strip and solder it to the LED board.
- Cut a 3-pin piece from the right-angle header strip and solder it to the infrared sensor cable following the color order in the picture. You can add heat-shrink tubing to the wires before soldering them.

## Step 3 — Assemble the circuit



- Assemble the circuit on the protoboard following the picture and the schematic. Pay attention to the polarity of the electrolytic capacitors and the transistor.

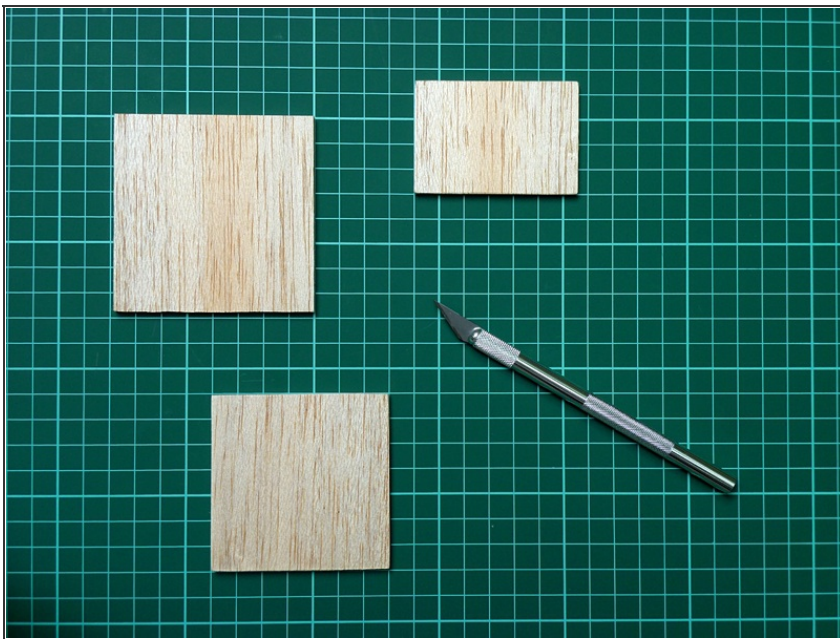
## Step 4 — Program the Arduino



```
luminch_one | Arduino 1.0
File Edit Sketch Tools Help
luminch_one
// Luminch_One - Copyright 2012 by Francisco Castro <http://fran.cc>
//
// This program is free software: you can redistribute it and/or modify
// it under the terms of the GNU General Public License as published by
// the Free Software Foundation, either version 3 of the License, or
// (at your option) any later version.
//
// This program is distributed in the hope that it will be useful,
// but WITHOUT ANY WARRANTY; without even the implied warranty of
// MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE. See the
// GNU General Public License for more details.
//
// You should have received a copy of the GNU General Public License
// along with this program. If not, see <http://www.gnu.org/licenses/>.
//
#define LED_PIN 3
#define SENSOR_PIN A0
//
#define SENSE_THRESHOLD 150
#define TRACK_THRESHOLD 230
#define DEBOUNCE_CYCLES 30
#define START_TRACKING_CYCLES 180
#define END_TRACKING_CYCLES 210
#define HAND_MINIMUM_CHANGE 15
//
int adc input = 0;
```

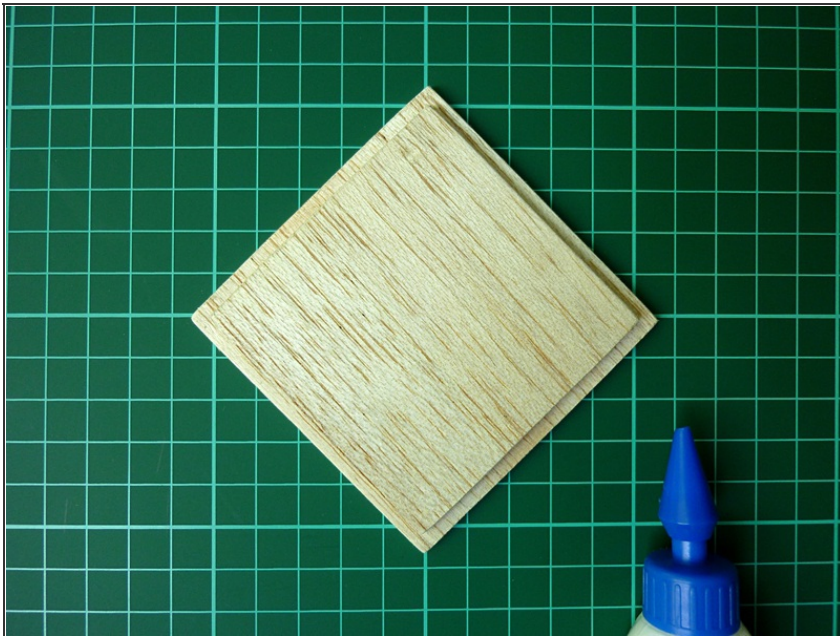
- Connect the Arduino to your computer using the USB cable.
- Download the [source code](#) for the project.
- Start the Arduino IDE and open the luminch\_one.ino file.
- Configure the board type and serial port for your Arduino in the IDE.
- Upload the code to the Arduino.
- Test if it works!

## Step 5 — Cut the balsa sheet



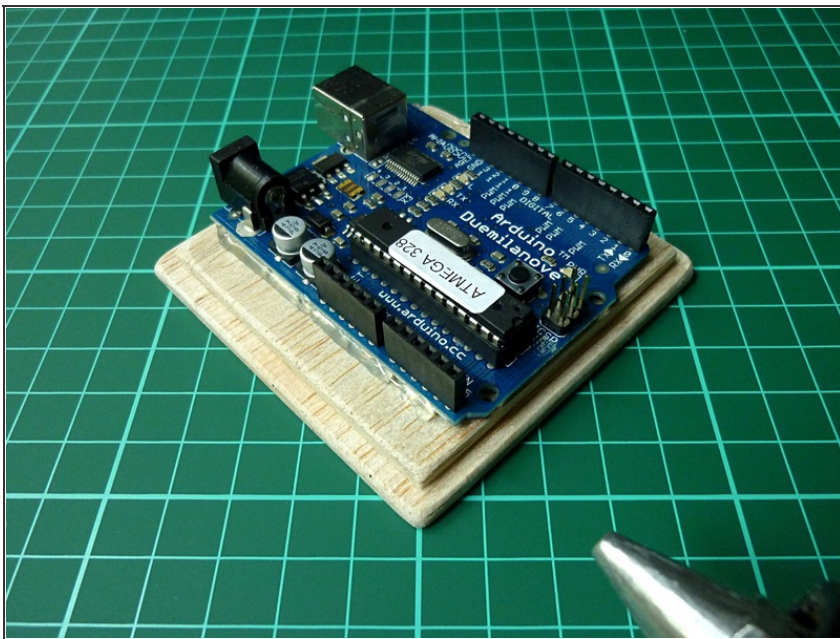
- Cut three pieces of balsa wood of the following sizes: 77 mm x 77 mm, 70 mm x 70 mm, and 45 mm x 65 mm.

## Step 6 — Glue the base



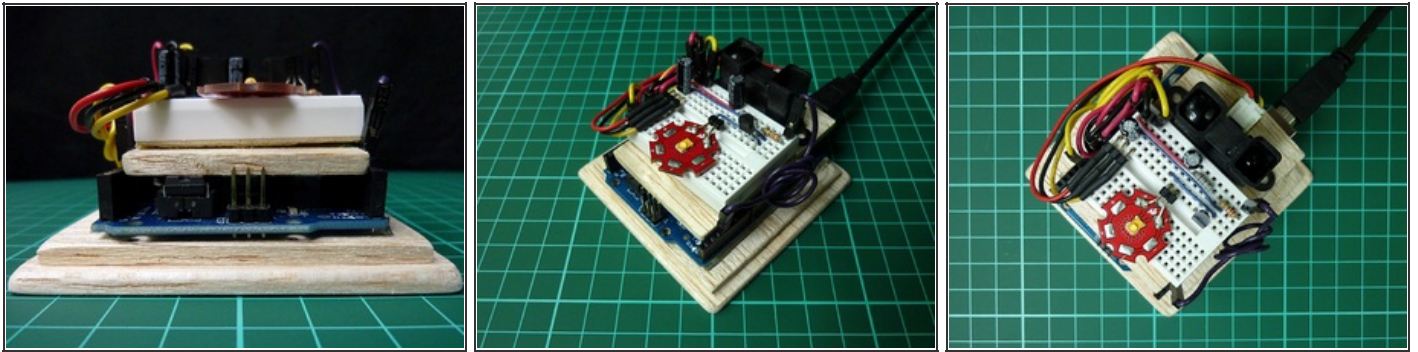
- Glue the 70x70 mm balsa square on the center of the 77x77 mm balsa square using the white glue.
- Let it dry for two or three hours under a heavy object like a large book.

## Step 7 — Glue the Arduino



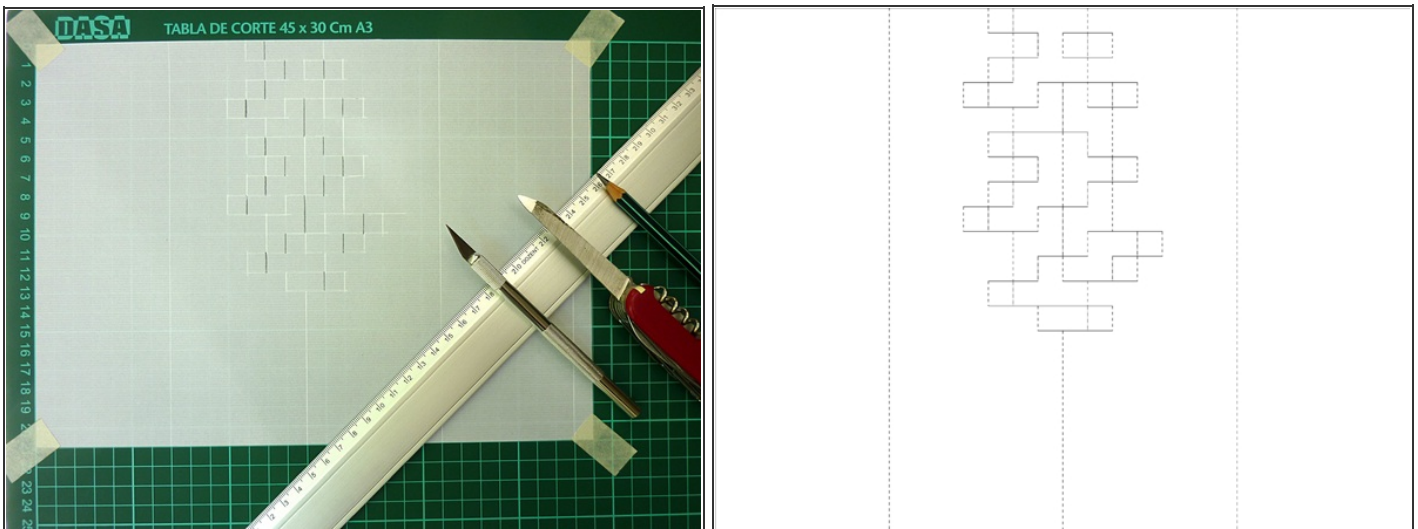
- Glue the Arduino on the center of the wood base using the hot-glue gun. Make sure the board of the Arduino does not stick out of the small square of the base. Only the USB connector of the Arduino must stick out of the small square.

## Step 8 — Stack the circuits

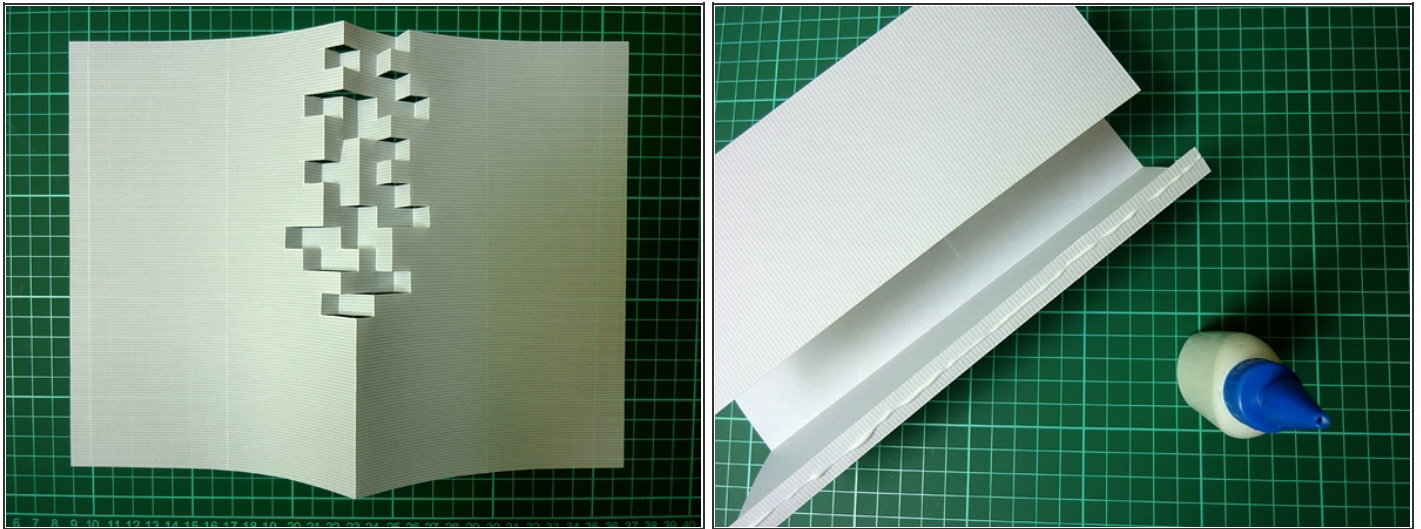


- Glue the protoboard and the infrared sensor to the 45x65 mm balsa piece.
- Put the 45x65 mm balsa piece on the top of the Arduino and fold the cables on the sides.

## Step 9 — Cut and score the lampshade

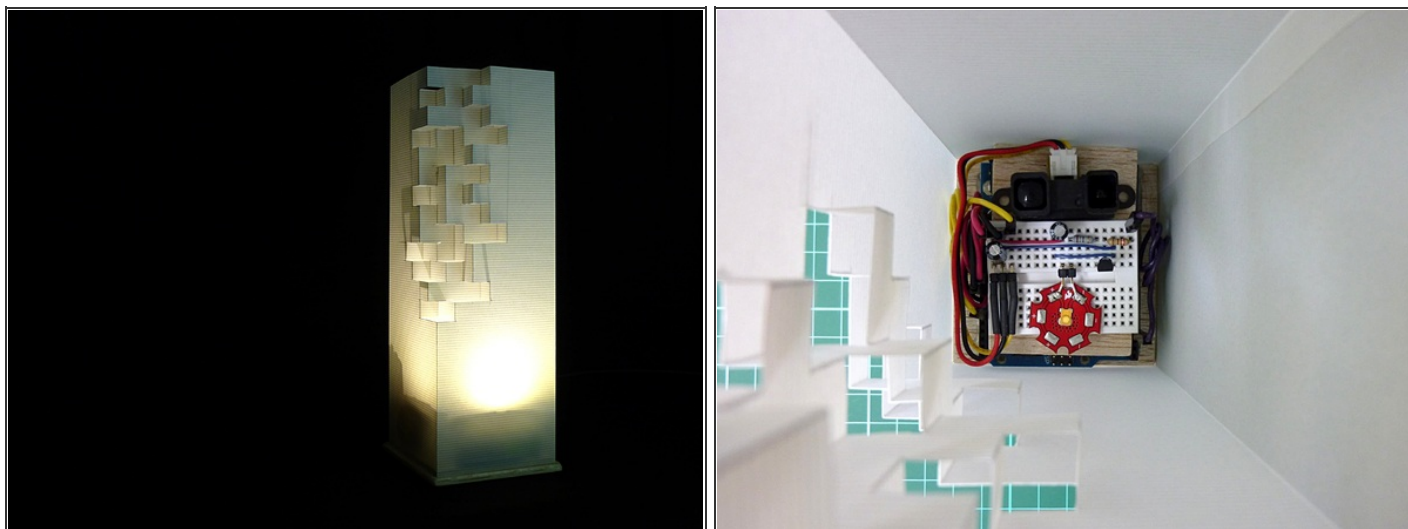


- Print the `luminch_one_lampshade.pdf` file from the [project files](#) on the A4 tracing paper sheet.
- Fix the A4 tracing paper sheet to the cutting mat using the masking tape.
- Cut the solid lines of the pattern using the hobby knife.
- Score the dashed lines with the point of the file tool of the Swiss Army knife or with another paper scoring tool.
- Remove the sheet from the cutting mat.
- Score the dot-dashed lines on the back side of the sheet with the point of the file tool of the Swiss Army knife or with another paper scoring tool.

**Step 10 — Fold and glue the lampshade**

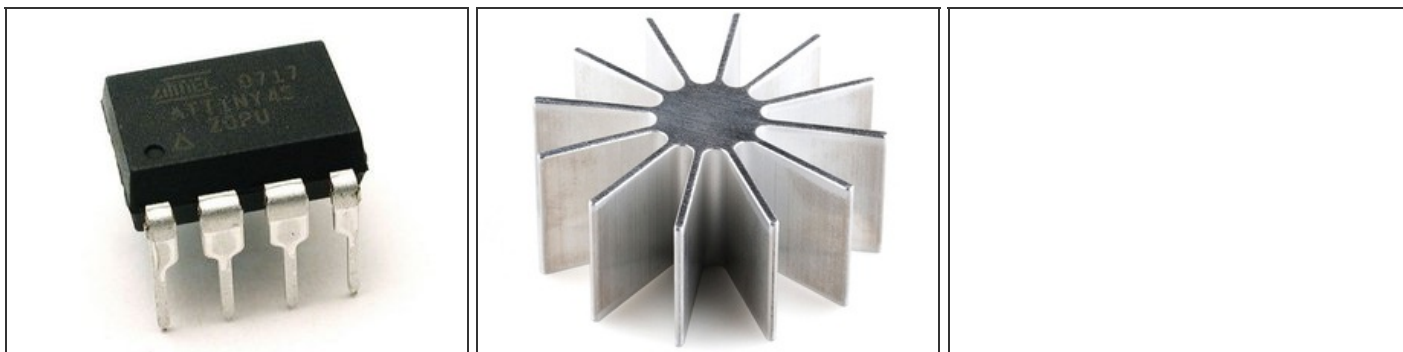
- Fold the sheet following the dashed and dot-dashed lines. Dashed lines are valleys and dot-dashed lines are mountains.
- Glue the flap to shape the lampshade as a square prism.
- Cut a square hole for the USB connector of the Arduino.

## Step 11 — Assemble the lamp



- Put the lampshade on the wood base.
- Connect one end of the USB cable to the Arduino.
- Connect the other end of the USB cable to the USB wall charger.
- Plug the USB wall charger into a power outlet.
- Enjoy! :)

## Step 12 — Further improvements



- Replace the Arduino with an ATtiny45 or ATtiny85 to reduce the size of the circuits.
- Attach a heat sink to the LED and replace its resistor by a smaller one (6.8 to 10 ohms) to increase the LED power.
- Replace the hot-glue with screws to ease disassembly at the unit's end-of-life.



## Step 13 — End-of-life disassembly

- Remove the circuits and the hot-glue from the balsa wood pieces.
- Cut the lampshade and the balsa wood in small pieces and compost them in your garden.
- Disassembly the circuits by removing the cables and the components from the protoboard.
- Reuse the Arduino and the electronic components in another fun project!

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